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The Greatest Present Need of Railroads

by F. Lincoln Hutchins

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The reports of the Interstate Commerce Commission show the cost of stationery and printing as follows:

1897	\$ 5,939,878	which is	\$5294	for each million of revenue.
1901	8,634,017	which is	5434	for each million of revenue.
1905	12,191,299	which is	5375	for each million of revenue.
1909	16,366,329	which is	6765	for each million of revenue.
1913	22,197,934	which is	7294	for each million of revenue.

This gives a slight indication of the burden now carried by the American railroads from the function of reporting; but it does not begin to tell the whole story as the largest part of the cost of redundant reports is not in the blanks, but in the clerical force needed to fill them out, make the required compilations, and the extra supervisory force receiving and using them.

Great efforts are now being made by the managers of many of the railroads to increase the efficiency of operation, but these efforts are handicapped because of the lack of detailed information as to the fundamental simple facts. The segregation of the function of records from all other functions would result in a scientific method of unit records by which accurate information could be had to determine the relative efficiency of the present operation and make evident the lines upon which effort should be expended to produce the greatest results in the shortest time. Not the least advantage of scientific statistical method is that by taking the shortest path from the original enumeration of the carefully defined facts to the final summation and analysis of those facts the minimum of expense is entailed; and this would reduce the cost by amounts greatly exceeding those above named.

Efficient operation cannot be measured by the amount of expenditures; money units contain too many variables to satisfy a stable "bench mark." Difference in wage scale seldom affects efficiency, while greatly changing costs. A reduced pay-roll cost may be, and often is, accompanied by a much greater loss in efficiency, as when a low priced man is cut off requiring a higher priced man to do the work. On the other hand an increased pay-roll may result

in increased efficiency and lessened cost, through effective supervision and the relief of high priced men of cheap work, through employment of lower grade assistants. In both of these cases a money unit would be misleading.

An increase in revenue should not, per se, justify an increased cost. A change in character of traffic, or in rates received for the same traffic, should cause no change in cost. An increase of revenue caused by acquisition of new traffic flowing in opposite direction to that already in hand should result in a decreased cost per unit, and does not call for increase in total expense. On the other hand a diminution in revenue does not justify neglect of proper maintenance, or even of operating costs per unit. A large part of the cost is entirely independent of revenue, being in the nature of a fixed charge having no relation to the amount of the revenue.

Genuine efficiency depends upon accurate records; no efficient action in human affairs is knowable until records of results have determined what is efficient. The naturalist must have records of all that pertains to nature before he can have a perfect knowledge of his science. The astronomer must have records of observations covering long periods of time before he can predict stellar occurrences. The archeologist seeks in the records of antiquity that knowledge which enables him to write the history of the race. The geologist reads the records implanted in the enduring rock by the immutable laws of the universe and efficiently traces the progress of the earth through eons of time. Darwin could have never formed his epoch making discovery of the law of the survival of the fittest had he not had copious records, drawn from all sources, by travelers, explorers and scientific investigators. In short, wherever we look, in religion, science, law, or art, it is records that enable it to be; as the records are true so is the religion true, the science accurate, the law just, and the art efficient.

The art of railroading is of too recent an innovation to have accumulated a fund of exact records; only in the most superficial sense can it be said to have any records. The progress of rail transportation has been too rapid to permit of careful attention to securing records. The emphasis has been placed upon doing the work immediately in hand as best it could be done under the personal direction of those having more or less experience to guide them. There has

been no thought of seeking records of others' experiences, or of making records for the guidance of others in similar work.

Again, the men who have developed the art of rail transportation have not been statisticians; their training and inclinations have been antagonistic to statistical information. There is still among the managers of American railroads a veiled contempt for any statistical determination of the efficiency of operation. This attitude results, in part, from their knowledge of the multiplicities and ever changing conditions of operation; in part to their experience with current practice in report making, through which partial, complex, and misleading conclusions are drawn, unless they are supplemented by personal observation and knowledge.

No railroad in the United States has a comprehensive, adequate statistical method by which to control its operations. The reason is obvious, for in the days of short lines, over which the superintendent could make daily trips, thus keeping in personal touch with all of its details, there were few other than the financial reports. As lines became extended and combinations lengthened the jurisdiction of the manager, information supplementing personal observation was found necessary, and this was secured through reports made upon blank forms sent out to the party upon the ground to be filled in and returned.

Such report blanks were hastily prepared, to cover the particular need then in mind, by men who had no statistical training. No attempt was made to correlate, or co-ordinate these report forms to fit them for other use. Such reports were often continued long after the particular need had passed, or was better supplied in other ways, to the lumbering up of the files and entailing needless clerical costs. Such reports, being unscientifically prepared, lacking the exact definitions needful to inform the makers as to just what was to be included, failed to convey exact information; and when new information was needed the effort to secure it led to the formation of new blanks, prepared in the same illogical manner, until to such an extent has this grown that the roads, in the present day, are staggering under a tremendous accumulation of reports, of which very many are worthless so far as the giving of exact and reliable information is concerned.

It may be observed that the railroads are in an exceptionally favorable situation to obtain ideal statistical records.

The units are few and simple so that they may be exactly defined. The power to secure accurate records of such units is ample and complete. These two fundamentals comprise the main requisites of scientific statistics, which require only the correct application of statistical methods to produce accurate results.

Railroads are manufacturing entities producing a service: this product is in passengers and merchandise transported: the units are passengers, and freight-tons, carried one mile: the efficiency is determined by the time and effort expended to produce the results, not by the money received for that service, which varies through causes entirely unconnected with the ratio of effect produced to the energy expended in producing it.

It follows, then, that performance records must be divorced from financial reports. Bookkeepers, accountants, and auditors make poor statisticians, because their training is wholly along the line of monetary values, and this becomes too ingrained in their natures to permit them to think in other terms. They are also too much involved in watching financial results to enable them to take a broad view of purely operating statistics.

From the absolute fact that with every increase in efficiency there follows a lessened cost per unit, even when the total cost is increased, it is seen that to compare costs is entirely misleading. This is a thing that the financial man has great difficulty in realizing. To obtain accurate statistical knowledge it is necessary to obtain the facts by means of an individual unit record, which may be counted. This means that the unit must be so exactly defined as to enable the illiterate to comprehend it, and the record must be the number of times that it occurs in time and space. Such unit records aggregated give the basis from which any deductions may be obtained. Combined with other aggregates, similarly obtained, results may be obtained to answer any inquiry that may be made. Such unit records suffice for all needs, hence it is possible to abolish all duplication by any department and simplify the statistical effort.

Records to be exact must be made currently with the performance, by the party intimately associated with the work. Such records should carry notations of any abnormalities, or unusual situations, to the end that it may never be necessary to make inquiry as to the cause of any departure from normal results. This feature would afford

great relief to all departments that are now so burdened with efforts to explain past occurrences.

The "post-mortems," now so largely indulged in, are costing the roads a prodigious and unappreciated amount of money, with no resulting benefit; further than that, they divert the minds of the supervising officials from attention to the immediate pressing problems of operation and thus detract from their efficiency. It is doubtless true that, as regards some unit of performance, at some point, there is great efficiency. Unit records would bring this into view, and study of causes would serve to raise the efficiency of this element upon every part of the system. Statistical method requires the comparative deductions by which efficiencies of different locations may be known.

Competent arrangement of records upon the statistical plan makes all records self-providing; that is, each group of records must be arranged in a descending order from the most general to the particulars, wherein the total of the particulars must agree with the total of the general if the records are correctly made. Here is a current proof of accuracy, and with daily aggregations, errors would be immediately discovered and corrections applied. With proper unit records it is as simple and easy to aggregate the particulars separately, as to first mix up incongruous elements as is now done. Having aggregates of each particular permit of every possible combination, from which to deduce the answer to any question; not only so but the aggregates still remain to furnish the answer to any other question arising at any time, without seeking new information by means of special reports.

The accumulation of all data should be by means of simple sorting and counting. The facility with which sorting may be done is evidenced by the rapidity and accuracy with which mails are handled by the United States postal department. In postal cars with 80 separations the average is 25 sortings per minute, in postoffices from 45 to 50 pieces of matter per minute when making primary separations. With uniform records of railroad data it would be much more rapid because of the absence of irregular addresses and puzzling writing.

Having fixed the units the next step is to determine what information is necessary for an adequate and effective control of operation. Care must be taken to eliminate all reports which simply satisfy curiosity, an element which is

quite dominant in many of the reports now in use. Doing away of these would materially reduce cost and make more efficient the unit data obtained.

The original record having been made it should pass immediately out of the hands of the party making it, into the record bureau; and all subsequent use of that record should be developed by the record force, trained to efficient handling of same, having no incentive to blur or misuse it, a condition that now vitiates some reports. Relieving the operating department of all record work would liberate more clerks than would be required by a record department performing the same functions. Record bureaus, conveniently placed, could make efficient use of mechanical devices to expedite and cheapen the work. The co-ordination of records would make it possible for the bureau to answer any inquiry with least time and expense. This method would abolish all petty reports now made by the departments, divisions and localities; relieve local parties from all report making, now so indifferently performed, and which is most important, would save the mass of correspondence, now indulged in, to clear up doubtful points, correct errors and to obtain explanations. The ultimate aim would be to have daily records concurrently aggregated so that accurate results may be available as soon after performance as time for transmission of data permitted.

Substituting scientific records for the present unstandardized reports may be a very gradual process during which the present official routine may be least disturbed. When a complete scheme has been worked out with a definite place provided for any possible refinement in records, it will be quite a simple, undisturbing process to gradually introduce new unit records as the existing reports are exhausted, or become obsolescent. It will readily be seen that this function of records cannot be carried on efficiently without competent supervision; that a man well trained in statistical methods must be placed in charge of all records, that co-ordination, correlation, and a gradual approach to an ideally perfect method may be obtained.

The greatest need of the American railroads is accurate knowledge of individual facts and of the relations which exist between the aggregates of such facts; and this knowledge can be obtained only by the institution of the scientific method of records which comprises the fundamental essence of statistics.

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